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ABSTRACT

Six introductory educational psychology classrooms were differentially taught. One experienced an individually competitive structure (n=39) and five other sections experienced three different cooperative goal structures: one using intergroup competition (n=29), two without intergroup competition (n=29 and n=36), and two using Sharan's Group Investigation procedures (n=37 and n=39). A two-way repeated measures ANOVA design was used to examine pre- and post-test achievement scores by treatments within subjects. The six groups were not significantly different from each other on the pre-test. All six groups obtained significantly higher post-test scores. A significant interaction between treatment groups and time was obtained indicating higher achievement scores in the classrooms experiencing the Group Investigation treatment and the lowest post-test scores in the classroom experiencing intergroup competition. Factor analysis of a 14-item survey determined four subscales, three of which obtained statistically significant differences and more positive attitudes concerning learning, achievement and cooperation in the sections experiencing cooperative strategies. The data suggest that, while significant achievement gains were obtained by all teaching strategies, students who experienced the cooperative goal structures achieved the most, had a more positive experience, and preferred cooperative goal structures. Contains 26 references. (Author/KM)

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Cooperative Strategies For Undergraduate Teaching: A Comparative Study.

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INTRODUCTION. Renewed interest in Morton Deutsch's (1949) research has lead several scholars to examine the influence of cooperation and competition in public school classrooms. Kohn's (1986) book highlights the significantly favorable impact of cooperation over competition. Researchers such as the Johnsons (Johnson & Johnson, 1987), Elliot Aronson (Aronson et al., 1975; Lucker, et al, 1976; Blaney et al., 1977), Robert Slavin (1983) and Shlomo Sharan (1980) have produced a considerable volume of research demonstrating a great variety of small group cooperative pedagogical strategies for learning especially in elementary and secondary school classroom settings. A recent issue of the journal, Educational Leadership (November, 1987), was focused almost entirely on cooperative strategies at all levels of public education. Since these cooperative strategies are being recommended as viable classroom pedagogical strategies for learning, they have become relevant content for educational psychology classes stressing the applications of principals of psychology: eg., Johnson (1979), Davis (1983), Slavin (1988).

One solution to teaching about cooperative strategies is through experiential learning: that is by directly experiencing the strategy rather than didactic lectures or reading text material. Over the past few years I have been comparatively examining the relative effectiveness of cooperative strategies in secondary science and mathematics classrooms (Sherman & Thomas, 1986; Sherman, in press), as well as teaching many of my undergraduate and graduate classes by using several varieties of cooperative strategies. These strategies are also focal content for these courses. An earlier report (Sherman, 1986) differentially compared achievement and affect measures of four educational psychology classrooms taught with three different reward-structures including 1) an individually competitive, 2) a cooperative with inter-group competition, and 3) a cooperative structure without inter-group competition. Post-test achievement scores were uniformally and statistically ($p<.0001$) higher than pre-test scores, and, pre- and post-test scores did not differentiate among these three conditions. However, two forms of affective measurements obtained statistical significance ($p<.02$) indicating a much more favorable acceptance of both the course itself and the instructor when the class had undergone a cooperative reward structure. These earlier results suggested a relationship between cognition (learning) and affect.

The cooperative structures utilizing inter-group competition which were used in the earlier study (Sherman, 1986) were similar to Slavin's (1983) Student Team Achievement Divisions (STAD). The goal structure without inter-group competition, while similar to STAD, was based on Peterson and Janicki's (1979) technique. While STAD is admirably suited to drill activities associated with the lower end of Bloom's et al. (1971) taxonomy of cognitive objectives (knowledge and comprehension), it does not as easily allow for higher order objectives such as application, analysis, synthesis and evaluation. Sharan's (1980; Sharan & Hertz-Lazarowitz, 1980) Group Investigation (GI) model is much more suited to accomplishing higher order objectives. The present study is primarily concerned with the application and evaluation of Sharan's (1980) small group GI model as contrasted with the cooperative and individually competitive models presented in the earlier study (Sherman, 1986).

METHOD

SAMPLE. The educational psychology classrooms presently being reported on consisted of two sections of pre-service teacher education students (n's = 37 and 39) who were randomly divided into four-member teams and experienced Sharan's Group Investigation (GI) model of instruction. Their results are contrasted with other classrooms which are described in further detail in Sherman (1986). The other classrooms were noted as "Coop-Compete" (n=29), "Coop-Coop(A)", (n=29) and "Coop-Coop(B)", (n=36), and are described in greater detail elsewhere (See Sherman, 1986). For the most part the two GI sections were not different with regard to demographic descriptions reported for the other contrasting classrooms (Sherman, 1986).

PROCEDURE. All six classrooms studied sociometric measurement. While the students in the individually competitive section did their analysis in a solo manner, the cooperative sections did their analyses together. But, all sections described in the earlier study (Sherman, 1986) did this activity during a three week unit of study. The two Group Investigation sections in the present report accomplished their sociometric project over most of the semester rather than during a discrete period of time.

The GI model is a a small group cooperative learning technique that was developed by Sharan & Sharan (1976) and Sharan & Hertz-Lazarowitz (1980). According to this method a class is divided into groups of 5-6 students for the study of a particular topic. A group will proceed through six phases: topic selection, cooperative planning, implementation, analysis, synthesis, presentation of the final project, and evaluation. Groups plan their strategy of study so that each student is involved in the formulation and completion of the project. Students select a subtopic for which they are responsible. They contribute their research topic to the group and the group prepares a written paper and orally presents the material to the entire class. Further descriptions of these phases can be found in Sharan & Hertz-Lazarowitz (1980).

Earlier research in a university laboratory school (Sherman, 1984) provided an archive of sociometric data for several intact elementary classrooms. All sections of the educational psychlogy class analyzed these similar intact classrooms. Each data set consisted of responses to three positive nomination questions (Which three kids in this classroom would you like to 1) eat lunch with, 2) go uptown to a movie with and 3) study science with), one negative nomination question ("Which three kids in this classroom do you like the least"), and one classroom social distance rating score for each child in the intact classrooms. Each small group (or individual in the competitive goal structure) received a different intact elementary school classroom data base and each member had to complete a sociometric matrix form, make a bar graph, and construct a traditional sociogram displaying the network of friendship choices for the question which they had decided to accomplish. An instructor-prepared manual on "Classroom Sociometry" (Sherman, 1988) contained information on sociometric measurement and interpretation and was required reading in all sections of this class.

Each member then had to analyze their sociogram pointing out traditional sociogram discriptors such as "stars," "isolates," "chains," "triangles," etc. They also had to individually analyze the qualitative relationship between children's sociometric status in their sociogram and the children's classroom social distance ratings, as well as determine whether their sociogram looked like a "central" or "diffused" structure (Hallinan, 1976). Students in the cooperatively structured GI sections had to determine similarities and differences among their individual analyses and draw some conclusions about differential gender preferences for friendship in the classrooms. Their collective product was a written report and class presentation consisting of six parts including a collaboratively written introduction and conclusion and four individual contributions concerned with each sociometric question which each had analyzed. A total of 40 points was assigned to this project of which 8 points were designated for the introduction and conclusion (4 points each) and 8 points to each individual analysis. All group members received the same score for this project which was the score for the entire paper. All data had been previously analyzed and the solutions were compared to these previous analyses. Points were assigned for accurate solutions, conclusions and neatness of the paper.

DESIGN AND ANALYSIS. The two GI classrooms of the present study are contrasted with previously obtained results (Sherman, 1986). Following Cambell and Stanley (1966) a pre-test, post-test quasi-experimental design is used to contrast six intact classrooms' achievement scores. A two-way within subjects ANOVA design (subjects x time x treatment) with repeated measures on the time factor is used. Duncan multiple range tests are used in post hoc contrasts of the classrooms' pre- and post-test mean achievement scores. An anonymous official university sanctioned five-item "course/evaluation" survey, as well as a 14-item instructor-prepared survey, both of which were administered at the end of all the classes, are used as dependent variables which are contrasted with previous sections experiencing other forms of cooperative strategies or individual competition. These two instruments are described in greater detail in Sherman (1986). The five items of the course/survey are rated from "poor" (0) to "excellent" (4). Ten of the 14-items from the instructor-prepared survey are rated from "strongly agree" (0) to "strongly disagree" (4) and the remaining four items were semantic-differential adjectives rated on a continuum from 0 to 4. Type I error associated with multiple t-tests was reduced by using conservative (alpha<.02) two-tail independent sample t-tests in analyzing differences among the groups on the five items from the "course/evaluation" survey. The 14-items of the survey were inter-correlated and factor analyzed to determine underlying subscale structure. A varimax rotation of the initial principal components analysis was followed by a promax oblique solution. Factors with eigen values greater than 1.00 were used to determine the number of subscale sets. Factors were then inspected for conceptual consistency and then labeled accordingly. Items with factor loadings greater than .30 were included in subscales. Empirically derived (raw rating responses were used) summative subscale scores were then computed and one-way ANOVAs were applied to each, contrasting mean subscale scores among five of the differentially instructed sections (one of the sections, Coop-Coop-A, did not receive the 14-item survey).

RESULTS

The results of the present study obtained both different and similar results as the earlier one (Sherman, 1986). The primary purpose of the present study was to compare different cooperative goal structures with each other. As can be seen in Tables 1 and 2, none of the sections are significantly different from each other on their pre-tests, their post-test scores are significantly greater than their pre-tests, and the statistically significant interaction ($F(1,203)=3.60$, $p<.004$) between groups over time indicates that the GI sections were highest in achievement. Scores in the two GI sections ($n=76$) were significantly ($p<.05$) higher than those from the section experiencing inter-group competition, but not significantly ($p>.05$) higher than the other sections. One might conclude that effective learning had been accomplished in all sections, but the most effective learning was associated with the classrooms experiencing Sharan's Group Investigation model.

Since the official university "Course/Evaluation" survey was anonymously completed, only means and standard deviations were reported to the instructor. These data are presented in Table 3. Multiple comparisons were performed on these data by use of conservative two-tail independent-sample t-tests. To avoid Type I error associated with multiple t-tests, statistically significant differences among contrasts were accepted only if they were less than alpha=.02. The general pattern which was obtained from these contrasts was similar to the earlier study (Sherman, 1986), indicating that the individually competitive section was most negatively rated on all five survey items, followed by the section experiencing inter-group competition. The sections without inter-group competition were, in all cases, most highly rated. The classrooms patterned after Peterson and Janicki's (1979) technique (Coop-Coop A & B) were significantly ($p<.02$) more positive than the individually competitive section on all five survey items. The two GI sections (Coop-GI 1 & 2), though not significantly different from the cooperative groups without inter-group competition, did obtain significantly ($p<.02$) more positive evaluations than the individually competitive section on four of the five survey items. One might conclude from these analyses that the most positive course evaluations are contributed by students in sections experiencing cooperative goal structures without inter-group competition. Further evidence supporting this thesis is contained in the next analysis of the 14-item instructor-prepared survey.

Table 1

Mean Pre- and Post-test Scores for Six Differently Treated Sections of Undergraduate Educational Psychology (n = 209).

Sections	Pre-test	Post-test
Coop-Coop(GI-2) (n=39)		
Fall, 1987		
mean	33.23	50.92
s.d.	5.71	5.38
Coop-Coop(GI-1) (n=37)		
Spring, 1987		
mean	33.86	49.37
s.d.	4.53	5.94
Indiv-Compete (n=39)		
Spring, 1985		
mean	33.15	48.67
s.d.	6.20	9.08
Coop-Coop(B) (n=36)		
Spring, 1986		
mean	32.17	47.86
s.d.	5.74	5.39
Coop-Coop(A) (n=29)		
Spring, 1984		
mean	32.40	45.77
s.d.	5.64	7.47
Coop-Compete (n=29)		
Spring, 1985		
mean	31.34	43.68
s.d.	5.98	7.11

Table 2

Two-way Within Subjects ANOVA of Pre- and Post-test (Time) Scores of Competitive vs Cooperative Instructional Groups.

Source	df	MS	F	p<
Time	1	17162.99	1092.34	.0001
Time x Treatment	5	52.025	3.60	.004
Time x Subjects within Treatment error	203	20.86		

Table 3

Mean "Course/Professor/Evaluations" For Six Undergraduate Sections of Introductory Educational Psychology.

QUESTIONS	YEAR n's	TREATMENT GROUPS A COOP-COOP(A) & (B) 1984/6 52	B COOP-(GI-1 & GI-2 1987 76	C COOP-COMPETE 1985 29	D INDIV-COMPETE 1985 37
1. IN GENERAL HOW WOULD YOU RATE THIS INSTRUCTOR AS A TEACHER?		2.48 (0.63)a	2.62 (0.82)	2.14 (0.92)	1.86 (0.67)
Significant (p<.02) two-tail t-test contrasts: (A=B) > C > D.					
2. HOW WOULD YOU RATE THE EVALUATION AND TESTING OF STUDENTS IN THIS COURSE?		3.12 (0.88)	3.14 (0.80)	2.72 (1.16)	1.62 (1.01)
Significant (p<.02) two-tail t-test contrasts: (A=B=C) > D.					
3. HOW WOULD YOU RATE THIS COURSE IN TERMS OF ITS ORGANIZATION, CLARITY OF OBJECTIVES AND DIRECTIONS?		3.04 (0.82)	2.78 (1.02)	2.45 (1.09)	2.38 (1.06)
Significant (p<.02) two-tail t-test contrasts: A >C & D; B=C=D					
4. HOW WOULD YOU RATE THE INTEREST, ENTHUSIASM, AND STIMULATION THE INSTRUCTOR BRINGS TO THIS COURSE?		2.67 (0.79)	2.74 (1.05)	2.52 (0.78)	2.08 (1.09)
Significant (p<.02) two-tail t-test contrasts: (A=B) > D; B=C; C=D.					
5. HOW WOULD YOU RATE THE INSTRUCTOR'S ATTITUDE TOWARD STUDENTS (CONCERN, INTEREST, RESPECT)?		3.07 (0.85)	3.22 (0.92)	2.83 (0.95)	2.35 (0.98)
Significant (p<.02) two-tail t-test contrasts: (A=B)>D; B=C; C=D.					

[a] Figures in parentheses are standard deviations.

The correlational as well as descriptive statistics associated with the 14-item survey are initially presented in Table 4. Criticism of the earlier article (Sherman, 1986) suggested that these items should have been factor analyzed for underlying subscale structures. Thus, in Table 5 will be found the results of this factor analysis. A principal components procedure was followed by a varimax rotation and a subsequent promax oblique solution was determined. Table 5 contains the standardized regression coefficients associated with this four factor solution. The items have been permutted to reflect the descending magnitude of contribution of each item associated with each of the factors.

The last five items of the survey (10, 11, 12, 13 & 14) as well as item 2 were most strongly associated with Factor 1. With the exception of item 2, the other five items were all concerned with feelings about either evaluation (10) or the learning climate in the class. Item 2 was significantly associated with these other five items suggesting the view that cooperation with the instructor is a perceived norm. It was decided that this factor was describing perceptions about evaluation and, in general, the positive learning climate of these classrooms and was thus labeled "Learning". Responses to these six items were empirically summed to obtain Subscale 1. Items 2 and 13 were inverted in the empirical scoring of the first subscale. Relatively high scores indicate negative perceptions whereas low scores are the most positive perceptions concerning learning.

Factor 2 was most strongly associated with items 6, 3 and 9. Items 6 and 3 were almost the exact inversion of each other and were concerned with perceptions regarding "achievement." Item 9 suggested a view denying the desirableness of working "alone" towards achieving, thus favoring the positive view of cooperative effort. These three items were combined into Subscale 2 which was interpreted as attitudes toward cooperative "Achievement." In calculating this second subscale responses to item 3 were inverted. Relatively high scores indicate negative perceptions while low scores are the most positive perceptions about achievement.

Factor 3 was associated with five items including numbers 4, 7, 9, 14 and 1. It is believed that this factor is most descriptive of an attitude about "Cooperation". As can be seen in Table 6, this factor is inversely related to Factor 1 and 2. Four of the items (4, 7, 9 and 1) are concerned with cooperatively working together, while the fifth item (13) suggests that cooperation is "unthreatening". Responses to items 7 and 1 were inverted in the fourth subscale scoring. Relatively high scores indicate positive attitudes while low scores indicate negative attitudes concerning working with others. It should be noted that Factor 3 is inversely related to both Factor 1 ($r = -.24$) and Factor 2 ($r = -.32$). Both Factor 1 and Factor 2 obtained moderate positive correlation with each other ($r = .33$). Factor 4, described next, was least related to these first three factors.

Factor 4 was comprised of five items (8, 5, 7, 1 and 2), which were associated with perceptions about conforming or "Compliance" with the instructor's desire for students to have "good" interpersonal relations

by working together in the class. These five item responses were summed to yield the fourth subscale score. Relatively high scores indicate the most resistance to working together while low scores would indicate acceptance of the instructor's desire for cooperation.

Table 4

Inter-correlation Matrix of and Mean Values for 14 Survey Items Obtained in the Indiv-Compete, Coop-Compete, Coop-Coop(A & B), and Coop-Coop(GI, 1 & 2) groups (n=172).

Item #	1	2	3	4	5	6	7	8	9	10
2.	.06									
3.	-.13	.21								
4.	-.14	.15	.24							
5.	.15	-.10	-.18	-.11						
6.	.14	-.15	-.69	-.11	.23					
7.	.18	-.03	-.26	-.40	.38	.32				
8.	.10	.07	.04	.00	.26	.15	.23			
9.	-.08	-.13	-.17	.08	.07	.22	-.07	.02		
10.	.07	-.24	-.38	-.07	.24	.30	.27	.07	.08	
11.	.02	-.31	-.27	-.12	.09	.22	.06	.13	.00	.44
12.	.06	-.19	-.32	-.12	.14	.27	.09	.14	.07	.46
13.	.01	.22	.24	.23	-.06	-.19	-.23	-.01	-.03	-.40
14.	.09	-.19	-.38	-.15	.11	.34	.20	.07	.10	.70

Table 4 (continued)

Item #	11	12	13	14
12.	.76			
13.	-.31	-.27		
14.	.45	.50	-.49	

Table 5

Rotated Factor Pattern Matrix (Standard Regression Coefficients) with Items Permutted in descending Order by Magnitude of Factor Loadings.

Items	Factors F1	F2	F3	F4
11. Pleasant (0)<->(4) Unpleasant	.89	-.12	.10	.05
12. Good (0)<->(4) Bad	.85	-.02	.14	.13
10. Grading in this class is fair and equitable.	.67	.15	-.08	.06
14. Fair (0)<->(4) Unfair	.71	.13	-.01	-.03
13. Threatening (0)<-->(4) Unthreatening	-.50	.03	.37	.21
2. Only a few students cooperate with the teacher in this class.	-.32	-.24	.06	.33
6. It is good to be a high achiever in this class.	.04	.78	-.06	.17
9. It is good to be able to work on your own in this class.	-.08	.77	.50	-.07
3. It is bad to be a high achiever in this class.	-.12	-.71	.19	.06
4. I do not like working together with others in this class.	-.02	.11	.81	.06
7. Working together with your classmates is a good thing to do.	-.06	.08	-.66	.41
8. It is good to do what the teacher wants you to do.	.13	-.10	.11	.78
5. It is good to get along with others in this class.	-.02	.21	-.17	.59
1. It is good to help others with their schoolwork, except on tests.	-.09	-.03	-.35	.38
--- Inter-Factor Correlations ---				
Factor 1: Learning: Hi=neg. attitude	1.00			
Factor 2: Achievement: Hi=neg. attitude	.33	1.00		
Factor 3: Cooperation: Hi=Pos. attitude	-.24	-.32	1.00	
Factor 4: Compliance: Hi=Neg. attitude	.08	.10	-.04	1.00

The preceding Factor analysis indicates four factors which, all together accounted for nearly 68% of the variance among these 14 items. The next strategy in these analyses was to compute empirically derived subscale scores as indicated by the items associated with each factor. After computing each of these subscales, four 1-way ANOVAs were used to contrast mean subscale scores among each of five different classroom goal structures (Individually competitive, Cooperation with intergroup competition, the Cooperative classroom without intergroup competition, and the two sections using the Group Investigation approach). These results are contained in Tables 6. Three of the subscales obtained statistically significant differences among the various classrooms. The first subscale describing attitudes about evaluation and "Learning" obtained statistically significant ($p<.001$) differences among the five sections ($F(4,167)=24.47$) indicating the most favorable perceptions being associated with cooperative classrooms which did not have inter-group competition, followed by the cooperative classroom with intergroup competition, and the most negative perceptions were associated with the individually competitive classroom. A somewhat similar pattern was obtained for the second subscale which is described as attitudes towards cooperative "Achievement". The Individually competitive or inter-group Competitive classrooms had significantly more negative perceptions than the cooperative groups which did not use intergroup competition, and, the GI sections had the most positive perceptions on this second subscale). The third subscale describing perceptions concerning "Cooperation" indicated the most positive perceptions (high scores) in the cooperative sections and the individually competitive section had significantly ($p<.05$) lower or negative perceptions. No significant ($p>.05$) differences were obtained among the five sections on Factor 4.

Table 6

Mean Scores for Four Subscales Derived From Factors One Through Four.

Sections	Mean Subscale Scores			
	Scale 1[a]	Scale 2	Scale 3	Scale 4
Indiv-Compete (n=32)	13.34 (A)[b]	4.34 (A)	15.03 (B)	5.56
Coop-Compete (n=29)	9.28 (B)	3.44 (AB)	15.68 (AB)	4.24
Coop-Coop(GI2) (n=39)	7.15 (C)	2.92 (B)	16.67 (A)	5.26
Coop-Coop(B) (n=35)	6.29 (C)	3.06 (B)	16.68 (A)	5.14
Coop-Coop(GI1) (n=37)	6.22 (C)	2.81 (B)	16.59 (A)	5.35
Number of Items in Scale	6	3	5	5
Possible Ceiling	24 (- att.)	12 (- att.)	20 (+ att.)	20 (- att.)
Possible Floor	0 (+ att.)	0 (+ att.)	0 (- att.)	0 (+ att.)
Significant ($p<.05$) 1-way ANOVAs $F(4,167)=$	24.47	2.44	2.63	1.17 (ns)

[a] Scale 1 reflects attitudes towards evaluation and learning. Scale 2 reflects attitudes towards achievement. Scale 3 reflects attitudes towards cooperative learning. Scale 4 reflects attitudes towards compliance with instructor goals.

[b] Means with the same letter are not significantly ($p<.05$) different from each other (Duncan Multiple Range Test).

CONCLUSIONS

In summary, six introductory educational psychology classrooms were differentially instructed. One section was individually competitive, one included inter-group competition, and four sections used cooperative strategies without inter-group competition, two of which were structured according to Sharan's (1980) Group Investigation Model. A two-way repeated measures ANOVA design revealed that the six groups were not significantly different from each other on a comprehensive pre-test achievement measure. All six groups obtained significantly ($p<.001$) higher post-test scores as contrasted with their pre-test scores. A statistically significant ($p>.04$) interaction between treatment groups and time was obtained leading one to conclude that while all groups demonstrated equal achievement, the GI sections obtained the greatest average achievement. All five items from a course/evaluation survey indicated significantly more negative ratings being associated with the

individually competitive classroom. Factor analysis of a 14-item survey determined three subscales which obtained statistically significant affective differences among the different sections generally indicating more negative perceptions being associated with the individually competitive as contrasted with the four cooperative groups. The data suggest that while significant achievement gains were obtained by all teaching strategies, students have a much more negative experience with the individually competitive and prefer cooperative goal structures, especially those without inter-group competition and patterned after Sharan's Group Investigation model. While these findings are not dramatically different from the earlier findings (Sherman, 1986), it would be important to note that achievement in the GI sections was the highest. This might be reflecting both stimulation of higher-order thinking through interaction with one's peers as will as positive attitude about the cooperative learning process. These findings would be supportive of a hypothesis predicting a relationship between cognition and affect.

The domain of educational psychology has had a long and continuing interest in sociometric measurement: eg., from Redl & Wattenberg (1959) and Gronlund (1959) to Asher & Gottman (1981) and Cole, et al. (1982). It is believed that the measurement and interpretation of classroom sociometry offers a unique point of integration between the two disciplines of educational psychology and sociology. The social-psychological considerations associated with the particular teaching strategies examined in this study might also be a significant point of integration and common interest for both psychology and sociology. While the primary focus of the present study was to examine the effectiveness of several variants of cooperative and individually competitive goal structures, the content area being taught (sociometry) is particularly germane to the teaching of undergraduate sociology and educational psychology. Nevertheless, the pedagogical strategies which were studied are believed to be just as important as a focus of study. An even more integrated future study might examine the influences which these pedagogical strategies have on the classroom sociometry of the very students who differentially receive cooperatively or competitively structured activities.

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